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PERSONALITY CORRELATES OF ACCIDENT INVOLVEMENT AMONG YOUNG MALE DRIVERS

by

Lillian Casler Schwenk

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Graduate Faculty in Partial Fulfillment of
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Dean of Graduate College

Iowa State University
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Ames, Iowa

1966

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INTRODUCTION

Accidents are a major public health problem. They rank fourth as an overall cause of death in the United States, accounting for a total of over 107,000 deaths in 1965. Motor-vehicle accidents annually kill about 49,000 persons, injure approximately 1.8 million persons, injure 1 out of every 14 males between the ages of 15 and 24, and cause 40 percent of all the deaths of males between 15 and 24 years of age (31).

Highway traffic safety is of paramount concern to the general public as well as to highway and traffic officials. While the motor-vehicle death rate per 100,000,000 vehicle miles has remained fairly steady in recent years, the loss of life, number of injuries, and property losses have been increasing sharply. Research efforts must be accelerated in the hope of finding early solutions to many of the problems involved in reducing the ever-increasing number of traffic violations, accidents, and fatalities. We cannot in good conscience stand aside but rather must apply all possible effort toward understanding and solution.

The problem of accidents is to a considerable extent a problem of human characteristics and human limitations. All analyses of the causes of traffic accidents show the human element playing a predominant role. Research on these human factors has been going on for over thirty-five years. Many

studies have used inadequate measures or insufficient sample size, and no research method has been successful in establishing a firm relationship between human characteristics and accidents. The evidence does show, however, that some validity of prediction is possible, particularly in the use of personality traits when combined with other selected factors.

Youths have been charged with a large portion of the responsibility for the serious traffic-accident problem before us. On the basis of numbers of licensed drivers and on the basis of miles driven, drivers under 20 years of age have the highest accident rate (31, p.54). Few youthful drivers suffer from physical deficiencies and many seem to demonstrate a relatively high degree of skill; their high accident and involvement rates have been attributed largely therefore to inexperience and to mental and emotional immaturity (4, p.27).

Many facets of human characteristics remain to be explored, singly or in varying combinations, if we are to solve the problem of accident and violation involvement. The studies reviewed have covered a wide range of approaches over a long time span. The present study proposes to analyze the relationships between aspects of personality, as measured by the Minnesota Counseling Inventory, and selected socioeconomic and biographical variables,--using males 15 to 24 years of age.

REVIEW OF LITERATURE

Sappenfield has stated that the psychology of adjustment is concerned with the everyday behavior of "normal" individuals (34, p.3):

> It is concerned with the motives that underlie their continued search for satisfaction and happiness, with the frustrations and conflicts that complicate their activities, with the surges of anger and anxiety that they experience, and with the variety of techniques that they adopt for the relief of anxiety and for overcoming obstacles to peaceful or safe living.

The processes of human adjustment cannot be understood as isolated segments of the individual's total behavior. "Each thing the individual does is related to everything else he does" (34, p.3). Personality processes, such as generalized habits, attitudes, beliefs, interests, and motives, have a significant function in the determination of behavior--as does environment. The psychology of safety is a part of the psychology of adjustment, for the concerns are the same.

Much of a general nature has been written concerning human characteristics and behavior that may be responsible for the appalling loss of life, countless personal injuries, and costly property damage resulting from motor-vehicle accidents throughout the country. Only a few, however, have

persistently sought specific solutions to the problem through the application of scientific techniques. Herein is pieced together available evidence regarding personal characteristics of motor-vehicle drivers, and their accident-involvement relationship.

Attitude and personality have been examined as factors in accident and violation involvement, both singly and in combination with each other or with other factors. A doctoral dissertation by Schuster (35) had as its goal the development and checking of attitude scales to predict drivers who would be involved in violations and accidents. Over 2,000 subjects were tested and their driving records checked. Two attitude scales were derived and cross-validations showed that the concurrent accident and violation records of drivers could be predicted significantly better than chance, using the accident attitude scale coupled with previous driver record.

Schuster and Guilford (36) undertook further psychometric prediction of problem drivers, aimed at predicting from assessed personality and biographical characteristics. Drivers with moving violations or accident involvement were the focus of attention. The aim of this research was to develop attitude scales "which would predict which individ-

uals are likely to become problem drivers of either kind" (36, p.420). Correlations of approximately 0.35 were obtained.

Case and Stewart (7) also developed a scale, aimed at measuring driving attitude. Four items concerning driving speed were used for classifying the subjects in terms of speed. Ten items were found to be endorsed to a greater degree by fast drivers and were selected for a "fast" key. Similar procedure produced a "slow" key. The "fast-slow" key was composed of all item alternatives from the two separate keys and was scored algebraically. Using these three keys (Slow, Fast, and Fast-Slow), predictions of speed classification were correct, on the average, for about 66 percent of the cross-validation group. The traffic behavior expressed by the item alternatives was consistent, in most instances, with fast or slow driving (7, p.34). Another exploratory study (17) reported on an instrument developed to measure attitudes toward the various aspects of driving activity. Data analysis revealed a positive correlation between age and men's favorable attitudes toward police, rules, and regulations, as well as causes of accidents. Attitudes toward Causes of Accidents correlated +0.15 with Accidents/Responsible. Attitude toward Rules and Regulations had a significant correlation of +0.13

with age, better attitudes being associated with age and experience. Older men also had better attitudes toward police, with a correlation of +0.19. For women, attitude toward Speed was significantly correlated, -0.28, with number of violations. "Certain items appeared clearly to be measuring an attitude of competitiveness, or aggression" (17, p.27). It was concluded that aggressiveness was significantly related to violations for men but the relationship decreased with age. For women good attitudes toward speed were associated with fewer violations and accidents.

Haner (18) developed a psychological inventory which is used as the basis of underwriting automobile insurance for male drivers under twenty-five years of age. It was thought that the way a person drives is determined by his attitudes and that attitudes are far from perfectly correlated with age (18, p.62). After using this attitude test for three years, Haner believed it was capable of identifying groups of youthful male drivers who have varying probabilities of being involved in automobile accidents of their own making. There also appeared to be a relationship between the seriousness of the accident and performance on the psychometric device. The reliability of the inventory was determined on samples of

subjects at three different times using the split-half procedure. The corrected split-half reliability coefficient was 0.89 for 310 subjects.

Another well-known attitude scaling device is that known as the Siebrecht Attitude Scale (40) composed of a series of statements which are evaluated by the individual whose attitude is being measured. "The Scale has a split-half reliability of 0.81" (39, p.4). Brody (4, p.47) states: "A few paper-and-pencil tests have been devised as short cuts in the determination of attitudes. Only one, however, has been developed in accordance with generally accepted procedures of constructing and standardizing written tests. This is the Siebrecht Attitude Scale....." Others (7, p.30) have found the Scale "to be unsatisfactory" as an attitude measure.

Rommel (33) reported an attempt to isolate those personality characteristics distinguishing accident-repeating and accident-free youths, using students in Pennsylvania high schools. Using five sub-scales of the Minnesota Multiphasic Personality Inventory (MMPI) and a Driving Attitude Inventory, he found that those scales and items which reflected a disregard for social mores and which emphasized activity and enthusiasm had some differentiating power, with the accident-

repeaters scoring significantly higher than the accident-free (33, p.14). There was a high positive correlation, 0.80, between scores on the Hypomania (Ma) and Psychopathic Deviate (Pd) scales of the MMPI for the accident-repeating group. The difference in means on the Pd Scale between the accident-free and the accident-repeaters was statistically significant at the .05 level and the difference in means for the Ma Scale was significant at .01. The r_{bis} for each was .35 and .43 respectively. Rommel's N's were small.

McGuire's (27) 1956 use of a paper-and-pencil inventory of personality items attempted to pinpoint those items of value in the prediction of future accident behavior. "The test items are of the personality type and were selected from a large number of items that differentiated between two groups of drivers to at least the 5 percent level of confidence" (27, p.1259). The two forms, A and B, correlate 0.85 and produce reliability coefficients of 0.89 and 0.76, respectively. Both forms correctly predict accident-free drivers or accident-repeater drivers about 65 percent of the time.

Suhr (42)(43)(44) used sixty commercial drivers selected according to supervisors' subjective estimates and objective ratings of driving ability, as well as accident records from

company files. A significant difference was found between highly rated drivers and those who rated below average. The M factor on the Cattell 16 Personality Factor Questionnaire, Bohemianism-Practical Concernedness, yielded a consistent difference which was significant beyond the 5 percent level of confidence (44, p.23)(44, p.45)(42, p.559)(43, p.34). Suhr concluded that in respect to personality-trait research, "The findings have been more indicative than conclusive" (44, p. 16).

Tillman and Hobbs found that high- and low-accident groups differed markedly in their personality characteristics and concluded that "... accidents reflect the basic personality of the individual" (46, p.330). The high-accident group showed marked intolerance for, and aggression against, any authority.

Venables (49) was concerned with the relationship between measures of performance consistency and scores on measures of emotional instability and introversion-extraversion. Two scores of driving consistency were found to be related negatively to neuroticism, or emotional instability, and to extremes of introversion-extraversion on two groups consisting of highly skilled, and lesser skilled police drivers.

These relationships were not found in a group of motor-club drivers. A British test, that of Heron, was used to measure neuroticism while the introversion-extraversion dimension was defined by a version of Guilford's rhathymia scale. The conclusion was that "These findings between personality measures and consistency of driving performance are of some practical importance but need confirmation with large numbers" (49, p. 23). Only twenty-six drivers were tested.

Brown and Berdie (5) found slight relationships between the driver behavior and MMPI scores of 993 male college students. The statement was made, however, that knowledge of the kind of personality organization and motivation of a driver may be useful for purposes of both licensing and training drivers (5, p.21). The relationship between scores on the Pd and Ma scales and numbers of accidents and violations was small but statistically significant, as found also by Rommel (33).

Moffie et al. (30) studied the relationship between psychological tests and driver performance. The tests used were the Otis SA Test of Mental Ability, the Bennett Test of Mechanical Comprehension, the Kuder Vocational Preference Record, the Bernreuter Personality Inventory, and the MMPI.

"This study, like many in the past, has shown some relationship between psychological traits and driver performance. Unlike many, it has disclosed the importance of the personality of the driver as a factor in safety" (30, p.22). Safe drivers were shown to be more tense, less self-sufficient, and less dominant, as measured by the Bernreuter Inventory. None of the MMPI scales were significantly related to driver performance.

An investigation in 1958 by Gates to determine the relationship between emotional immaturity and accident-proneness concluded (14) that a relationship exists.

Using driving records, an interview, and the Thurstone Temperament Schedule, Heath examined 763 offenders and 195 non-offenders (19). He concluded that for purposes of distinguishing traffic offenders from non-offenders, impulsive, sociable, and reflective trait measures appeared to provide for such differentiation. However, the active, vigorous, dominant, and stable trait measures were not of such value. Seven items of biographical information were found which appeared to be of value for purposes of distinguishing between the two groups; five items were not of value. The following combination of personality traits and biographical data were

listed as being of value for prediction: impulsive and sociable traits, in combination with the biographical items of age, marital status, education, occupation, number of positions held during the preceding five-year period, reasons for terminating previous employment, and annual salary.

Levonian et al. (26) presented their subjects, truck drivers, with multiple-choice verbal items representing specific driving situations involving personal interaction and asked the subjects how they would behave in the situations. Responses were correlated with personality and biographical variables: authoritarianism, competence, other-directedness, age, sex, education, occupational rating, and residential area. The results indicated that "The combined personality variables accounted for only about 1 percent of the variance in the average driving item, whereas the biographical variables contributed about 4 percent" (26, p.26). It was concluded that "The relationships corresponded with those that would be expected from logical considerations", with driver responses being useful in the prediction of accidents (26, p.33).

Shaw's use of projective personality tests, the Rorschach and the Thematic Apperception Test (TAT) has shown value for use in the prediction of accident liability among South

African truck drivers (38, p.34). Mrs. Shaw's comprehensive psychological and statistical research project has been in progress during the last ten years. The psychological aspect has been directed at finding a method of assessing each individual applicant for a driver's job "... as a whole -- namely assessing his intelligence, skill and physical attributes in relation to his total personality makeup" (38, p.34). Originally, a selection battery of only intelligence and ability tests was used, on over 1,000 subjects. She found that it was possible to select more efficient drivers and to reduce training costs. However, of the 150 new drivers thus selected, many had to be discharged for repeated accidents, some of which were serious mishaps. It became apparent that the method might have solved the training problem but in no way alleviated the accident problem. "The existing testing program was hopelessly inadequate, and ... some test, or tests, would have to be found which would reveal not only undesirable character traits, but also such factors as maturity of outlook, motivation, attitudes and personality integration" (38, pp.36-37). The problem of combining competence with safety was overcome by the added use of projective tests. Experiments with the Rorschach showed that African subjects did not respond very

well to this test. The TAT looked more promising and a version suitable for urbanized African subjects was constructed. Detailed follow-up studies showed highly significant differences between the success rates (lowered training and vehicle maintenance costs as well as an improved accident situation) on 212 TAT-selected and 299 non-TAT-selected drivers. The subjectivity of the assessment of accident potential had been substantially reduced. The findings of this study have been consistent in that "... it has been possible to establish a general basis on which the assessment of potential accident liability can be made" (38, p.64).

Shaw has established five categories of accident risks as a guide for assessing the probability of success as a driver, on a continuum ranging from potentially bad to potentially good. While listing personality characteristics within each category, she states that some subjectivity still remains for each driver is an individual problem; it is the assessment of the total personality pattern which has meaning, especially when "... the balance and integration of that pattern" (38, p. 65) are considered. If "... the person functions on a fairly even keel, is well adjusted to his circumstances and has learned to live with himself and his environment, then the prognosis is good. If there is pronounced imbalance of any kind, ... if his adjustments are inadequate or unrealistic",

the prognosis is bad (38, p.65).

Shaw has given us valuable information on the relationship between personality and accidents (38). Her findings are consistent with those of Rommel (33) and Brown and Berdie (5) and their work with the Pd and Ma scales of the MMPI.

Selling (37, p.258) declared in 1940, "The literature is full of examination methods for traffic offenders but these are largely physical and psychophysical...the approach...has not yet been developed to an optimum degree...of not only examining...physically and intellectually but covering other phases in their mental and neurological makeup." It was concluded that those who come from minority races or groups made up in aggressiveness in driving for their lack of ability to succeed and to have social opportunity (37, p.262). "Background, psychophysical structure, physical structure, and emotional traits all enter into the personality" (37, p.261).

Several studies have been completed which combined psychophysical factors with those of personality and/or socio-economic status. Brody's early study (4) found little evidence to support the theory that socio-economic background influenced driver behavior. He also found that deviant reaction time of drivers was not related to number of motor-vehicle accidents, that driving skill alone did not ensure

safety, and that accident repeaters knew driving principles. It was concluded that personal maladjustments were more common among the repeaters than among the accident-free, while neither deafness nor a low intelligence was an important accident cause.

Malfetti and Fine (28) reported on a 1962 pilot study of the characteristics of safe drivers. Comprehensive biographical and driving records were solicited from 9,095 twenty-year or more award winners participating in the National Safety Council Safe Driver Award Plan. Six of the highest ranking were used in the pilot study which consisted of twelve hours of medical, psychological, knowledge, and driver performance tests. It was found that the subjects were no better physically than the average for their age and operated in at least the average range of intelligence. "In general, they are non-aggressive individuals with a high level of impulse control" (28, p.6). The subjects generally ranked average to poor in the knowledge tests but it was observed that during the performance tests, the subjects seemed to use what knowledge they possessed to a greater extent than do most drivers. Further study was recommended, particularly of the "...unusually good and rapid organizational ability of safe drivers" (28, p.9).

A complex investigation (32) into the role of psychological factors used tests of psychomotor functions; physiological measures; objective personality tests, including the MMPI and the Thurstone Temperament Schedule; clinical personality measures such as the Rorschach, the Sacks Sentence Completion Test, and the TAT; specific tests of personal characteristics: the Allport, Vernon and Lindzey Study of Values, the Taylor Anxiety Scale, and the Level of Aspirations Test; and biographical questionnaires. In addition, each subject was individually seen for a structured psychiatric interview directed to a detailed inquiry of the subject's lifetime driving history and his accident experiences. Statistical analyses of the various scales and measures failed to reveal any significant differences between these groups with regard to physiological reactions and there were no differences with regard to psychomotor functions. "In addition, most objective personality inventories and tests of such specific characteristics as manifest anxiety, level of aspiration, and I.Q., failed to discriminate" (32, p.13). For the groups studied, acceptance or rejection of conformity standards and conventional modes of behavior, and the degree and effectiveness of impulse control were major personal characteristics related to accident fre-

quency. "Accident-repeater and non-accident subjects differed significantly ($p = 0.10$) on six of these variables, the accident-repeater group...high on tension (anxiety) and unconventional behavior, and low on hostility/control ratio and tension tolerance" (32, p.14). Of the psychometric measures which initially appeared to discriminate, only the Allport, Vernon and Lindzey Study of Values discriminated accident-repeaters from the accident-free in cross-validation.

Brody's 1940 experiment (4) was based on tests of various mental and physical traits administered to twenty-six automobile drivers who had been involved in at least three reported accidents between 1935 and 1940, and to an equal number who were not involved in accidents. It was shown that the battery most suited for identifying accident proneness consisted of tests of systolic blood pressure, side vision, accuracy of reaction, and skill in passing-maneuvers. This battery "...was 92 percent effective in identifying individuals as accident-repeaters or accident-free drivers" (4, p.4). Fifteen years later he completed a more comprehensive study (3) in which he compared 375 chronic violators, 133 accident repeaters, and 124 controls on measures of reaction time, glare recovery, depth perception, visual field, acuity, the Sacks

Sentence Completion Test, intake interviews, and biographical questionnaires. This research indicated that psychophysical measures do not differentiate between good and bad drivers, whereas measures of emotional make-up and social adequacy have had some success. "While the general importance of personal adjustments and personality trends are indicated, it cannot be said with assurance: use this or that test in screening drivers... But the development of such tests remains one of the prime needs..." (3, p.2).

Conger et al. (10) investigated the personal factors that might make some drivers more susceptible than others to automobile accidents, using twenty airmen as subjects. Ten had been held officially responsible for two or more accidents in the preceding four and one-half years. They were compared with ten who had no record of accidents in the same period. The tests included a structured psychiatric interview, a psychological examination, as well as other functional tests. No differences were found between the two groups in either intelligence or psychophysiological responsivity. However, in the area of personality functioning, accident-repeaters "...displayed significantly poorer control of hostility, lower tension-tolerance, higher separation anxiety and dependency

needs, and extremes both of egocentricity or sociocentricity and fantasy-preoccupation or unreflectiveness" (10, p.1581). The tests used were the TAT, the Rorschach, the Wechsler-Bellevue intelligence scale, and the Sacks Sentence Completion test. All five variables mentioned were significant at the .01 or .02 level except "fantasy", which was at the .10 level. It was felt that psychological factors are clearly related to accident susceptibility.

The Ghiselli and Brown work of 1949 (15) involving taxi-cab drivers yielded a battery of tests which was found to have a validity coefficient of 0.59 for predicting accidents. The battery consisted of dotting, tapping, judgment of distance, distance discrimination, and mechanical principles. An arithmetic test and a paper-and-pencil test of complex reactions were found to be useless in predicting accidents. Interest measures showed some promise, particularly for scales of occupational level. "No significant relationships were found between the accident criterion and age, education, and previous driving experience" (15, p.546).

Kainuma (23) presented a report covering thirty-two references, all studies by Japanese between the years 1957 and 1965. Summarized were the personal characteristics

"...of accident repeaters or poor drivers in Japan" (23, p. 40). It was suggested that there were "...many possibilities for psychological counselling and audio-visual education for developing..." traffic accident prevention (23, p.35). The Japanese have researched drivers' mental states as they influence driving behavior, how driving behavior influences mental states, reaction time and motor reaction, intelligence, driving attitude per se, and personality. Kainuma's conclusion was that they "...could not solve the problems [of] why they had accidents without observing accident repeaters while driving" (23, p.40).

Much of the research has centered around the psychophysical areas such as that done by Slocombe and Brakeman (41) in 1930 in which they devised tests to measure perseveration, oscillation, speed, accuracy, and muscular control. They found that "...the ordinary correlation coefficient shows no significant relationship between test results and accident record..." (41, p.38). Marbe (29), in 1935, combined certain human deficiencies which he felt predisposed persons to accidents -- such as inability to concentrate or to distribute attention, clumsiness, absentmindedness, slow reaction time, proneness to fatigue, and addiction to alcohol. He expressed

the opinion that these could be detected by tests. However, he cautioned that the problem was not as simple as it appeared for the qualities predisposing to accident in a particular situation depended to some extent on the nature of the situation, therefore the tests must be preceded by careful analysis of the demands of the task, both physical and mental (29, p. 103).

Johnson and Lauer (22), in a study of fifty-three subjects at Iowa State University in 1937, found all correlations between reaction time and driving performance to be low and insignificant and concluded that driving performance is a complex function and cannot be at all adequately determined by any single measure of isolated response patterns known to be required in that performance.

Clark, at Michigan State University, in 1959 (8) tested the hypothesis that individuals who perform faster on motor tests than on perceptual tasks tend to have more accidents than individuals with faster perceptual than motor speed. Two groups, problem drivers and ordinary drivers, were equated for age, education, vocabulary, and mileage driven weekly. The results of three such tests of each type administered to each group yielded negative results.

De Silva, Robinson, and Forbes (12) made a study of 142 accident repeaters and 52 accident-free drivers and reported that the accident-repeater group was poorer on the average than the accident-free group on the psychophysical tests administered. The tests included reaction time, steering, speed estimation, glare vision, and a miniature highway passing test. The repeaters were found to operate in a tense, jerky manner much more frequently than were the accident-free.

Data on twenty taxicab drivers were collected from driving tests in which the Rogers-Lauer Driver Rating Inventory was used, as well as performance on the Auto Trainer. When test results of subjects were compared with their driving records, no relationships were found. It was concluded that neither the Rogers-Lauer scale nor the Auto Trainer is suitable for a criterion of driving performance and thus cannot be used in predictive studies. Lauer claimed a split-half reliability of 0.90 for his scale yet neither it nor the Auto Trainer scores distinguished between those drivers who had been convicted for a traffic law violation and those who had not (45, p.24)(45, p.26).

Many other studies could be described such as Danielson's study of the relationship of the fields of vision to safety (11), Cobb's (9) and Bransford's (2) studies of driving

performance, and Viteles' 1925 classic (50). Lauer developed and validated several predictors in the form of paper-and-pencil tests and confirmed the hypothesis that a properly selected group of such tests of driver aptitude is a better predictor of driving ability and more efficient than conventional psychophysical tests. "Until recently no one had established a satisfactory criterion of driving ability. Accidents are unreliable and no other criterion was found to do the job" (24, p.318). Lauer correlated thirty-two variables with the criterion and calculated the intercorrelations. From these results eighteen were found to be significant at the 5 percent level of confidence or better. Further investigation showed that there was little gain in validity when more than seven variables were used.

In the continual search for the key to accident and violation prevention it can be seen that many approaches and techniques have been used. It is interesting to note that interviews and case histories without further testing have also been tried. Two closely related studies are worth citing, both of which were undertaken under the auspices of the New York State Department of Public Works. The earlier report (25) covered 1,600 drivers in twenty-two observation

periods. All highway accident cases of record for a four-year period were examined and the reported details and accident type extracted for each driver. To complete the data, a home-interview questionnaire for these drivers was conducted to furnish information related to those medical and social characteristics more frequently associated with the accidents. A comparative analysis of these human factors was presented. The second study (1) involved visiting 1,567 households to obtain the basic sample, which was divided into 810 driver or interview households and 757 non-interview households. A schedule of sixty questions was used to interview 526 male and 284 female drivers. Their accident records were searched and evaluated. A total of 428 male and 122 female drivers were followed while driving and their driver behavior noted and rated on a scale. A table was developed to show the consensus of characteristics of variables which were underlying factors in their association with accidents. The various factors in the analysis included frequency of accidents by type, accident experience and age of driver and weight classification or age of cars driven. None showed significant differences. Driver behavior habits were also ranked by percentage of unsafe drivers. Four conclusions were drawn from the first study:

"faster drivers have more accidents than slower drivers, especially when judged by their speeds in the afternoon"; "higher accident rates are associated with younger drivers, larger amount of travel, and newer cars"; and "the majority of the accidents...occurred on dry road surfaces, during daylight, and involved other vehicles" (25, p.17). It can be seen that no items of information were obtained which cannot be gleaned readily from any current issue of Accident Facts (31). The only gain was knowledge that New York drivers fit the national averages.

A 1965 study closely parallels (13) the second of the two New York studies. Drivers studied were white males who drove in the District of Columbia and whose driving behavior was sampled for five minutes through film. This was done without the drivers' knowledge, past or present. The samples were rated by police officers, the drivers traced and interviewed by project staff members. It was found that 97 percent of the drivers committed at least one error during the five-minute sample. The project aim was to determine whether accidents can be predicted on the basis of observing a small sample of a driver's behavior without his knowing he is being observed.

Habitual traffic violators were the object of scrutiny

in a study involving 300 such persons (6). The group had 1,774 traffic violations during a twelve-month period, 76 percent of which were moving violations. The procedure consisted of interviewing these multiple-violation operators just prior to their court hearing on such a charge. Participation in the study was entirely voluntary, and during the twelve-month period only two individuals failed to participate. The prototype was revealed to be white, male, between the ages of 21 and 25, employed in a semi-skilled or skilled job, of average intelligence and of normal personality. This would lead to the conclusion that he probably did not differ much from the average population of motor-vehicle operators, except for his record of moving violations. Training rather than punitive measures was the solution offered.

In assessing the various approaches to accident-prevention research, there are so many factors which might have a bearing on the situation, and which should be taken into consideration, that it is virtually impossible to determine how much credit or blame can be attributed to any particular one. Studies were made on as few as ten subjects and as many as several thousand; some concentrated on personality while others considered attitude, psychophysical testing and varying

combinations of these with each other and/or other variables such as socio-economic factors, physiological measurements, driving knowledge, occupational interests, and intelligence. Interviews and case histories, as well as samples of driving behavior also have been used in analyses.

Goldstein (16) has done an excellent job in reviewing a wide range of literature. His survey unearthed no new techniques and tended to reinforce the belief that there is some relation between accident and violation rate and personality characteristics. True, some studies of personality factors have yielded inconsistent results; however, numerous investigations have yielded the conclusion that personality plays an important role in determining whether a driver will be accident- and violation-free or will be involved.

Of the studies included herein for discussion, fourteen were found which dealt exclusively with personality -- (5) (14) (19) (26) (27) (30) (33) (37) (38) (42) (43) (44) (46) and (49). Seven were concerned with attitude: (7) (17) (18) (35) (36) (39) and (40). The line of demarcation between the two groups is sometimes very thin thus, in a few cases, the decision to so categorize was arbitrary.

Eleven psychophysically oriented studies were cited which

included (2) (8) (9) (11) (12) (22) (24) (29) (41) (45) and (50). In addition, seven more were found which combined psychophysical testing with personality and/or attitude. These are listed as (3) (4) (10) (15) (23) (28) and (32).

Five other reports were included which did not fit any of the usual categories. (1) (6) (13) and (25) used unusual approaches such as interviews, case histories, and samples of driving behavior. Case et al. also included personality, attitude, intelligence, and socio-economic data (6). Goldstein's report (16) was not on a research project of his own but rather reviewed the field of literature which he felt was pertinent to our accident-prevention goal.

No researcher was found who used the Minnesota Counseling Inventory (MCI), a relatively new instrument, although many had used the MMPI from which the MCI was developed. Further research need has been indicated, particularly in the area of the relationship of personality variables to driving behavior.

METHOD OF PROCEDURE

General Statement of the Problem

It has long been recognized that motor-vehicle accidents and violation involvement are not a function of chance. "Some children, as well as some adults, have more accidents than others .....[A] number of studies ... have revealed that certain personality characteristics and environmental influences predispose an individual to behavior that leads to accidents" (21, p.155). There is, as stated by Hurlock (21), evidence to indicate that certain people are more likely to have accidents than others, and attempts have been made to determine what unique personal characteristics differentiate them from their fellow humans who do not have accidents or violations. "One cannot judge personality by stereotypes associated with certain physical or mental characteristics or even with certain interests ....." (20, p.463).

Research and planning are forerunners of progress in safety and efficiency. In view of the poor accident and violation record of our 15 to 24 year old drivers, whatever can be should be done to help young people become safer street and highway users. Often a lack of safety education and counseling results in attitudes that produce violations or

accidents. With over a million teen-agers coming of driving age each year, special importance must be attached to education and counseling.

This study was concerned with the human and environmental factors which might influence the liability of young drivers to accident and/or violation involvement. An attempt was made to determine the more relevant personality and socio-economic characteristics of such involvement. Briefly, the specific objective of the investigation was as follows:

> To determine the relationship between personality and selected socio-economic variables and accident or violation involvement.

This investigation was limited to male high school students in Minnesota because of the availability of data from three main sources: the schools, the University of Minnesota, and the Minnesota Department of Highways. A delimitation which appeared in the course of the study was the initial lack of adequate codes to classify accidents and violations, as well as father's occupation. A further delimitation was the fact that drivers' records are kept only five years and involvement beyond the time limit had to be ignored or the subject dropped from the study.

Subjects

The subjects were 1,964 male high school students attending grades 11 and 12 in sixty-five Minnesota high schools in the years 1960-1964 and who had been tested on the MCI through the Minnesota statewide testing program. Of these, 1,683 were used in the statistical analysis. A total of 281 of the original subjects were lost from the study. Four schools failed to reply to the initial request for information, accounting for a total of thirty-five subjects. Of the remaining 246, it was found that 219 had not applied for a driver's license and thus had no record which could be checked. Twenty more were dropped because they had been retested and had two sets of MCI answer sheets. The remaining seven were removed from consideration because of inaccurate or incomplete records, or death. Males only were used because they have poorer driving records, on the average (31), and also because of the difficulty of obtaining driving records for women.

Sources of Data

Four main sources of data were employed:

MCI answer sheets

The answer sheets for 1,964 subjects were provided by

the Student Counseling Bureau of the University of Minnesota. These had been collected in the course of the statewide testing program and were provided for analysis for the 1960-1964 period.

Nineteen scores were obtained from the answer sheets: Validity; Family Relationships; Social Relationships; Emotional Stability; Conformity; Adjustment to Reality; Mood; Leadership; Willingness to Admit Maladjustment; Social Introversion-Extraversion; Physical Health; Home and Family Adjustment; Self-sufficient Insensitivity; Masculine Egoism; Puritanical Over-Control; Intropunitive Withdrawal-Adolescent Depression; Extrapunitive Withdrawal; and two drop-out scales -- Male and Combined Male-Female.

In addition, the answer sheets provided the name and school for each subject as well as date and grade level at time of testing.

School records

Certain personal information needed for each subject such as full legal name, exact date of birth, father's occupation, parents' marital status, with whom the subject lived while attending school, and whether or not the

subject had been enrolled in a driver education course, best could be provided by school records. Since a certain amount of attrition was to be expected, the gathering of this information was approached in two stages to reduce the amount of work to be done by any one school.

The first stage consisted of sending a letter and simple form requesting only the full legal name and exact birthdate for each student included in the study. Examples are included in the Appendix. This specific information was needed prior to search of the drivers' license records.

The second stage followed the initial search of the license records and, as expected, some subjects had not applied for a license and were removed from further consideration. A second letter was sent to each school, reporting progress to date and requesting that a second and final form be completed. See Appendix. Requested was information as to father's occupation, parents' marital status, with whom the student lived while attending school, whether or not the student had been enrolled in a course in driver education, as well as information on the school such as whether or not driver education

was offered, type of program offered, number of counselors employed in the school, and which school personnel used the MCI.

Driver license records

Once the subjects had been accurately identified, it was possible to check the records of the Driver License Office of the Minnesota Department of Highways. Here it was ascertained whether the subject ever had made application for a license; if so, the date of his first licensure or rejection was noted. Given, too, were the reasons for rejection, if such were the case. This provided information, in some instances, as to physical disability. Also listed on each record, for the involved, was the identification number and date of each accident as well as notation of chargeability, the date and type of violations, and date of each warning letter, suspension, and/or revocation.

Accident records

If the preliminary search of the driver's license record revealed accident involvement, each accident report was pulled from the files for study. From these accident reports the accident type, names of drivers involved, number injured or killed, and the amount of property damage was determined.

Driver license and accident records were available for the period from October 15, 1959 through December 28, 1964.

Treatment of Data

Schools were arranged alphabetically and assigned a number from 1 to 65. The subjects within each school were grouped alphabetically by year tested and grade level, and numbered sequentially within groups. This provided an individual's six-digit I. D. number for data processing. The I. D. number of the subject was entered on a 3"x5" card along with his full legal name and birthdate. Labeled space provided for the date first licensed, as well as accidents and violations. Sample card is in Appendix.

On the first trip to the licensing office, these cards were used for recording information. The cards for 219 youths who had never applied for a license were subsequently removed and placed in a separate file. Additional cards were removed for those thirty-five students enrolled in the four schools which did not respond to the first request for information. Later in the study twenty-seven other cards were removed for reasons given earlier. A total of 1,683 cards was kept on file for later use, including the preparation of a numerically

ordered list of accidents to facilitate the accident records search.

Coding of data for processing

The first coding was that of individual identification, as described. As information was gathered, it became apparent that there were several coding systems to be established, including that of accident and violation type. The State of Iowa has such a system for data processing and this was revised for use with the Minnesota data. Care was taken to list every type of accident and violation which appeared on the driver's record and on the accident report forms. A two-digit system was devised with thirty-one violation classifications and fifteen accident types being used.

For purposes of classification of father's occupation, the Dictionary of Occupational Titles was consulted (47)(48). A code was developed as follows:

0 = unemployed
1 = unskilled (DOT 8,9)
2 = semi-skilled (DOT 6,7)
3 = skilled (DOT 4,5)
4 = agriculture, fishery, forestry, etc. (DOT 3)
5 = service (DOT 2)
6 = clerical, sales (DOT 1)
7 = professional, managerial (DOT 0)
8 = deceased

The driving experience of each subject had to be codified

for data processing. After a subject had been licensed for more than a year, it was in some cases difficult to determine the exact date of first licensure. When a license was renewed or a duplicate issued, no record was kept of the original date. By comparing license records against date of birth, dates of accidents and violations, as well as citations for failure to have a license, it was possible to arrive at some estimate of length of experience. The following eight-point scale ensued:

0 = newly licensed; no experience
1 = learner-under-instruction
2 = less than three months
3 = three-to-six months
4 = six-to-twelve months
5 = one year
6 = two-to-five years
7 = six-to-ten years

Both the occupation and experience groupings were slightly revised after the first data processing was completed. Since the sample sizes were too small within some of the gradations, some regrouping was necessary. The groups used in the final analysis were as follows:

Father's occupation

0 = unemployed, unskilled
1 = semi-skilled
2 = skilled
3 = agriculture, etc.
4 = clerical, sales, service
5 = professional, managerial
6 = deceased

S's driving experience

0 = six months-and-under
1 = six-to-twelve months
2 = one-to-two years
3 = two-or-more years

All remaining data were coded simply or recorded directly.

Data processing

The MCI scores were key-punched directly from the answer sheets onto data-processing cards, one input card for each subject. Two additional input cards were prepared for each subject: the first included information as to number of violations and type, birthdate, age at testing, experience, denial of license, reason for denial, physical disability, number of warning letters, number of suspensions and/or revocations, school driver education program, enrolled in program, number of school counselors, MCI use, father's occupation, with whom lived while in school, and parents' marital status. The remaining card carried information as to number and type of accidents as well as number killed or injured and property damage in each accident, and subject's chargeability. The division of information was arbitrary to fit the IBM card columns, and was made before preparation of the flow sheets.

Before the initial computer runs, it was decided to eliminate some of the variables from the statistical analysis and concentrate on the M scores and accident and violation involvement.

Two output IBM cards were prepared for each subject, summing across the involvement factors. These cards carried the following information: first, the nineteen MCI scores; second, the total number of violations, ever denied a license, number of warning latters, total suspensions, total revocations, total number of accidents, sum of number injured, sum of number killed, total property damage, and sum of chargeable accidents.

An IBM 360 computer was used for the data analysis. Pearson Product-Moment correlation matrices and summary statistics were produced for the total sample and for subsamples, using "occupation" and "experience" as moderators.

FINDINGS AND DISCUSSION

Total Sample

Of the 1,683 young males in the study, it was found that 1,069 had a record clear of any accidents or violations, leaving 614 subjects to account for a total of 450 accidents and 768 violations. When accidents alone were considered, no involvement was recorded for 1,338 subjects. No violations were found for 1,239 of the subjects.

Table 1 presents the number of violations and the number of accidents for the drivers involved in the study, as well as the breakdown of the accident total. It can be seen that 345 males accounted for the 450 accidents while 444 were responsible for the 768 violations. Of the 450 accidents, 269 -- or 60 percent -- were one-time-only and involved 78 percent of the drivers. The drivers involved in two accidents accounted for 17 percent of their total while tallying 26 percent of the accidents. These first two groups thus accounted for 95 percent of the involved drivers and 86 percent of the accidents. The 278 subjects who had only a single violation were responsible for 63 percent of their total number and for 36 percent of the total violations. Subjects with from one to three violations accounted for 75 percent of the total

while involving 92 percent of the drivers with violation records. It appears that most of the involvement with accidents and/or violations was of a single instance, yet there were recorded as many as six accidents and ten violations for some subjects.

Table 1. Frequency distributions of number of accidents and number of violations

Accidents			Violations		
Number of accidents	Number of subjects	Total number of accidents	Number of violations	Number of subjects	Total number of violations
1	269	269	1	278	278
2	59	118	2	87	174
3	9	27	3	41	123
4	5	20	4	19	76
5	2	10	5	11	55
6	1	6	6	3	18
			7	1	7
			8	1	8
			9	1	9
			10	2	20
Total	345	450		444	768

It must be noted here that not all drivers included in the study had been driving for the same number of years. This could, in part, account for the high incidence of one-time-only accidents and violations, and was a factor in this variable's (driving experience) being used as a moderator and

not as a correlational variable.

In the 450 accidents, 186 persons were injured, five lost their lives, and property damage amounted to $172,500. It was found that 301 of the accidents were chargeable to subjects in the study.

Further analysis of the driving records revealed that twenty-seven had at one time or another been denied a license, for a total of thirty-five denials. Of these, seventeen had failed the written and/or driving test, eight could not pass the vision test, and two suffered a physical disability. These eventually were licensed.

Further, 217 were sent warning letters, while 244 suspensions and fourteen revocations were imposed.

Tables 2 and 3 summarize the accidents and violations by type and by sequence-number. See the Appendix for the codes used. The most common type of accident, regardless of when it occurred in the accident-sequence, was motor vehicle-motor vehicle -- accounting for 79 percent of the total number of accidents in the study. This type of accident seems relatively no more prevalent as a first accident than as a second-or-more. As would be expected from national statistics (31), the second most common type of motor-vehicle

accident was running off the roadway. These accidents accounted for 10 percent of the total, while hitting a fixed object -- with 4 percent of the entries -- was third. The last two types held up proportionately as well as could be expected given the number of accidents. Since 93 percent of the accidents were of these three types, those types remaining are of little importance.

Table 2. Subtotals of accidents by type and by number

Accident-type	Accident-number						Total
	1	2	3	4	5	6	
01	4	1	0	0	0	0	5
02	271	64	12	7	2	1	357
05	2	0	0	0	0	0	2
06	7	1	0	0	0	0	8
07	2	0	0	0	0	0	2
08	3	0	1	0	0	0	4
09	12	3	2	0	0	0	17
10	0	1	0	0	0	0	1
11	4	1	0	0	0	0	5
12	39	5	1	0	1	0	46
13	1	0	0	1	0	0	2
14	0	0	1	0	0	0	1
Total	345	76	17	8	3	1	450

Speed too fast for conditions was the most common violation among the young males studies, totalling 34 percent of the total of 768 violations. Careless driving occurred 17 percent of the times when violations were accumulated, with

Table 3. Subtotals of violations by type and by number

Violation-type	Violation number										
	1	2	3	4	5	6	7	8	9	10	Total
01	146	63	20	19	7	2	2	1	0	0	260
02	12	6	2	0	0	0	0	0	0	0	20
03	11	2	1	0	0	0	0	0	0	0	14
04	16	2	3	1	0	0	0	0	0	0	22
05	58	11	3	3	0	1	0	0	0	0	76
06	19	6	3	1	0	0	0	0	0	0	29
07	5	2	3	0	0	0	0	0	0	0	10
08	8	1	3	0	0	0	0	0	0	0	12
09	16	11	4	0	0	0	0	0	0	0	31
10	1	0	0	0	1	0	0	0	0	0	2
11	77	24	14	5	4	2	0	1	0	0	127
12	8	3	1	1	1	0	0	0	0	0	14
13	3	1	0	0	0	0	1	0	0	0	5
14	1	1	2	0	1	0	0	0	0	0	5
15	2	2	0	0	0	0	0	0	0	0	4
16	2	0	2	0	0	1	0	0	0	0	5
17	5	2	3	2	2	0	0	0	0	0	14
18	3	4	0	0	0	0	0	0	0	0	7
19	2	0	1	0	0	0	0	0	1	0	4
20	8	0	0	0	0	0	0	0	0	0	8
21	0	2	4	1	2	1	2	2	2	1	17
22	11	1	2	0	0	0	0	0	0	0	14
23	13	6	5	1	1	0	0	0	0	0	26
24	3	1	2	0	0	0	0	0	0	1	7
25	1	0	1	0	0	0	0	0	0	0	2
26	7	7	0	3	0	0	0	0	0	0	17
27	3	4	0	0	0	0	0	0	0	0	7
28	0	1	0	0	0	0	0	0	0	0	1
29	2	3	0	1	0	0	0	0	0	0	6
30	0	0	0	0	0	1	0	0	0	0	1
31	1	0	0	0	0	0	0	0	0	0	1
	444	166	79	38	19	8	5	4	3	2	768

disregard for stop signs adding another 10 percent. The remaining 39 percent of the violations was quite evenly divided among over a dozen other violations, with every type of violation being included. The three most frequent violation-types persisted over the sequence and this was especially true of excessive speed and careless driving. Again, these results resemble those found in annual surveys (31).

Analysis of the driving experience of the 1,683 subjects revealed the following:

As of October, 1964, twenty-four were newly licensed and had little or no experience. Ten were learners-under-instruction, while sixty-three had been driving for less than three months. There were fifty-seven with from three to six months experience, and 134 who had been driving from six to twelve months. This means that 288 of the subjects had less than one year of driving experience. One full year of experience was recorded for an additional 408. Most of the young men, 983, had been driving for two to five years, while four of them had six to ten years of experience. Almost 59 percent of the subjects thus had been driving over two years.

Among additional variables deemed of interest in the study were those relating to the family background of the

subjects. Occupational groupings were established, as discussed earlier, based on the father's occupation. The tabulations within the eight original categories yielded the following information:

Occupational status	Number of fathers
Unemployed	47
Unskilled	62
Semi-skilled	111
Skilled	217
Agriculture, fishery, forestry, etc.	695
Service	78
Clerical and sales	111
Professional or managerial	295
Deceased	67

Over 41 percent of this population came from homes which were basically agricultural in background. A few of these had indicated fishery or forestry as the specific occupation, but primarily the fathers in this occupational group were farmers. Except for the families where the father was deceased, the remaining homes were about equally divided between the first four groupings and the last three. The second largest category was that which contained the professional and managerial positions. This is probably explained by the inclusion of subjects from a large private school and from some of the larger communities in Minnesota. There was,

however, a wide geographical distribution of the schools included in the study, with a wide range of population size.

Further examination of the families involved furnished information as to the parents' marital status and with whom the young male lived while attending high school. Tabulated by number of subjects involved, the results were as follows:

Parents' marital status	With whom the subject lived
1521 = Married	1447 = Both parents
16 = Divorced	94 = Mother
13 = Separated	33 = Father
97 = Widowed	78 = Other
28 = Court appointed guardian	31 = Unknown
8 = Unknown	

It can be seen that the majority of the subjects came from normal homes, that is from homes where the parents are still married and living together. The seeming discrepancy between the number with married parents and the number indicated as living with both parents can be explained. Two boarding schools were included and many of these students were living away from home. Too, in some of the more remote school districts some students were living away from home while attending school. It was interesting to note that the subjects for whom their home life was listed as "unknown" were enrolled in larger schools; the smaller schools all were able

to supply the requested information.

The schools themselves were studied for information as to the driver education programs and the counseling service available. Table 4 presents the availability of driver education programs.

Table 4. Availability of driver education within the 61 schools

Type of program	Number of schools	Subjects involved
None	4	151
Classroom only	3	42
Complete course	54	1490
Total	61	1683

It was found that seven young men had managed to enroll in a driver education course even though it was not offered in their school. No explanation was given although 151 subjects were from schools where no such program existed and 144 were indicated as not taking the course because it was not available. A total of 491 subjects did not enroll in driver education, when regularly offered in the school, while an additional forty enrolled for the classroom phase only. There were 1,047 who did enroll in the complete course, four of whom failed. One subject was listed as having taken the behind-the-wheel phase only. This remains a mystery since

this is not regularly accepted procedure; there is probably some logical explanation which was not provided.

Table 5 displays the availability of counseling service in the schools studied.

Table 5. Availability of counselors within the 61 schools

Number of counselors	Number of schools	Number of subjects involved
0	22	427
1	30	813
2	4	196
3	3	90
4	1	156
5	1	1
Total	61	1683

Within the schools in the study, the counselor was most often reported as being the one who used the MCI -- being listed in twenty-three out of the sixty-one schools. No one used the MCI in nineteen schools; the driver education instructor was the user in eleven reports. Four schools stated that both the counselor and the driver education instructor used the test. Only one administrator-user was found in the report but three schools listed both the administrator and the driver education instructor as MCI users. Schools having counselors did not seem to need their administrators for such duty, but driver education teachers often shared this task

with either the counselor or the administrator. MCI counseling use was found in forty-two of the sixty-one schools.

For the statistical analysis of the data twenty-nine variables were inter-correlated, nineteen of which were MCI trait measures and ten of which were accident and/or violation related. In addition, the correlations among these twenty-nine variables were moderated by two additional variables: father's occupation and subject's driving experience. In Table 6 are presented the results of the gross analysis, involving the entire sample of 1,683 young male subjects. The key to the listed variables is found in the Appendix.

Findings revealed that of the twenty-nine variables, seven were not significantly related to any other variable. Eight of the accident or violation related variables correlated significantly with fourteen of the MCI trait measures, at or exceeding the .05 level of significance. Identification of these significant variables follows:

MCI variable	Title
2	Family relationships
3	Social relationships
4	Emotional stability
5	Conformity
8	Leadership
9	Willingness to admit maladjustment
10	Social introversion-extraversion
12	Home and family adjustment

MCI variable	Title
13	Self-sufficient insensitivity
14	Masculine egoism
15	Puritanical over-control
16	Intropunitive withdrawal; adolescent depression
18	Drop-out scale, Male
19	Drop-out scale, Combined male-female

Involvement variable	Title
20	Number of violations
21	Times denied a license
22	Number of warning letters
23	Number of suspensions
24	Number of revocations
25	Number of accidents
28	Sum of property damage
29	Number of chargeable accidents

The two accident and violation related variables which did not correlate significantly with any of the trait measures were: the number injured, and the number killed.

Thirty-eight correlations between the MCI and involvement variables exceeded the .05 significance level. Nineteen of these obviously greatly exceeded this level. Further "t" tests were made to determine the exact levels exceeded. Eight were significant at the .01 level while eleven exceeded the .001 level of significance. The significance levels are indicated in Table 6 and elsewhere by asterisks; one (*) indicates .05, two (**) signify .01, while three (***) indicate the

Table 6. Means, standard deviations, and correlation matrix for selected variables

Var	$\bar{X}$	s	1	2	3	4	5	6	7	8
1	2.9608	2.0050	1.00							
2	10.5455	6.9628	-0.20	1.00						
3	24.4831	12.1584	-0.24	0.24	1.00					
4	14.9210	6.8829	-0.36	0.52	0.46	1.00				
5	13.5520	4.3304	-0.15	0.66	0.03	0.49	1.00			
6	13.5253	7.9414	-0.34	0.62	0.45	0.78	0.59	1.00		
7	12.4593	4.5091	-0.02	0.38	0.54	0.56	0.32	0.53	1.00	
8	13.1331	5.0579	-0.21	0.29	0.82	0.54	0.16	0.52	0.58	1.00
9	9.7499	5.8846	-0.39	0.68	0.42	0.78	0.67	0.87	0.49	0.52
10	4.4385	3.1657	-0.17	0.17	0.87	0.35	-0.04	0.34	0.50	0.74
11	1.8841	1.2605	-0.10	0.09	0.07	0.36	0.11	0.19	0.26	0.09
12	1.5609	1.5224	-0.10	0.77	0.11	0.30	0.55	0.36	0.29	0.15
13	11.0749	2.5847	0.28	-0.34	-0.52	-0.62	-0.23	-0.58	-0.49	-0.52
14	17.3868	4.1303	-0.04	-0.14	-0.72	-0.28	0.04	-0.23	-0.53	-0.66
15	4.6958	1.9440	0.43	-0.35	-0.26	-0.51	-0.27	-0.55	-0.10	-0.27
16	3.0957	2.2842	-0.23	0.42	0.55	0.62	0.39	0.72	0.55	0.57
17	8.6821	4.4333	-0.32	0.56	0.32	0.69	0.59	0.82	0.36	0.39
18	15.8835	9.0979	-0.29	0.73	0.53	0.74	0.68	0.86	0.55	0.58
19	15.8057	9.2485	-0.29	0.78	0.45	0.72	0.72	0.86	0.51	0.52
20	0.4569	1.0135	0.01	0.07**	-0.03	-0.01	0.14***	0.02	0.00	-0.03
21	0.0208	0.1893	0.02	0.04	0.03	0.01	0.04	0.04	0.04	0.03
22	0.1289	0.3690	0.04	0.00	-0.07**	-0.06*	0.06*	-0.03	-0.01	-0.07**
23	0.1450	0.5210	-0.02	0.06*	0.05	0.04	0.11***	0.03	0.01	0.05
24	0.0083	0.1192	-0.02	0.02	0.06*	0.01	0.03	0.04	-0.02	0.02
25	0.2674	0.6128	-0.02	0.05	-0.09***	0.01	0.12***	0.04	-0.00	-0.06*
26	0.1105	0.5503	-0.04	0.02	0.00	0.02	0.05	0.01	-0.01	0.03
27	0.0030	0.0808	0.03	0.00	-0.00	0.02	0.02	0.01	0.02	-0.01
28	1.0250	4.2320	-0.02	0.02	-0.05	0.04	0.06*	0.03	-0.01	-0.04
29	0.1788	0.5004	-0.01	0.05	-0.07**	0.01	0.11***	0.02	-0.00	-0.04

Table 6. (Continued)

Var	9	10	11	12	13	14	15	16	17	18	19
9	1.00										
10	0.31	1.00									
11	0.16	0.04	1.00								
12	0.44	0.10	0.00	1.00							
13	-0.54	-0.41	-0.19	-0.19	1.00						
14	-0.19	-0.70	-0.07	-0.11	0.35	1.00					
15	-0.50	-0.15	-0.10	-0.16	0.34	-0.01	1.00				
16	0.62	0.42	0.11	0.23	-0.49	-0.28	-0.38	1.00			
17	0.76	0.21	0.17	0.29	-0.49	-0.12	-0.49	0.55	1.00		
18	0.87	0.39	0.15	0.49	-0.55	-0.26	-0.47	0.73	0.76	1.00	
19	0.86	0.34	0.14	0.55	-0.51	-0.21	-0.46	0.71	0.77	0.96	1.00
20	0.03	-0.03	-0.01	0.07**	0.03	0.06*	-0.02	0.03	0.02	0.10***	0.10***
21	0.02	0.02	0.04	0.02	-0.01	-0.02	0.00	0.03	0.04	0.05	0.06*
22	-0.01	-0.06*	-0.00	0.03	0.07**	0.10***	0.02	-0.01	-0.01	0.03	0.02
23	0.06*	0.03	0.00	0.06*	-0.03	0.01	-0.05	0.06*	0.03	0.11***	0.09***
24	0.03	0.05	-0.01	0.01	-0.04	-0.03	-0.04	0.04	0.04	0.06*	0.05
25	0.04	-0.07**	-0.00	0.04	0.02	0.09***	-0.04	0.03	0.03	0.06*	0.06*
26	0.03	0.02	-0.02	0.00	0.01	0.02	-0.02	0.01	0.02	0.05	0.04
27	0.01	0.00	0.02	-0.01	-0.01	0.00	-0.02	-0.00	0.02	0.01	0.00
28	0.03	-0.04	0.01	0.00	0.01	0.07**	-0.06*	0.01	0.03	0.04	0.03
29	0.03	-0.06*	0.00	0.04	0.00	0.06*	-0.03	0.01	0.02	0.06*	0.05

Var	20	21	22	23	24	25	26	27	28	29
20	1.00									
21	-0.04	1.00								
22	0.61	-0.03	1.00							
23	0.68	-0.02	0.15	1.00						
24	0.27	0.02	0.08	0.23	1.00					
25	0.36	-0.04	0.26	0.26	0.11	1.00				
26	0.17	-0.01	0.11	0.18	0.00	0.46	1.00			
27	0.03	0.03	0.01	0.05	-0.00	0.08	0.05	1.00		
28	0.24	-0.02	0.13	0.21	0.08	0.54	0.37	0.56	1.00	
29	0.35	-0.03	0.27	0.25	0.07	0.84	0.43	0.06	0.45	1.00

highly significant .001 level.

The five most significant variables (exceeding the .001 level of significance) proved to be Social Relationships, Conformity, Masculine Egoism, the Male Drop-out Scale, and the Combined Male-Female Drop-out Scale. Social Relationships, Conformity, and Masculine Egoism seem to account for the personal factors which could presage accident involvement. Suspensions and violations correlated as highly with Conformity, and the two Drop-out Scales. Number of chargeable accidents and Conformity produced significant correlations beyond the .001 level, as did number of warning letters and Masculine Egoism.

Number of revocations correlated significantly, barely exceeding the 5 percent level, when paired with Social Relationships and the Male Drop-out Scale. This also was true of the times ever denied a license -- when correlated with the combined Male-Female Scale.

Social Relationships (SR) and Masculine Egoism (ME) correlated significantly with involvement variables as follows: SR and number of warning letters; SR and number of chargeable accidents; ME and sum of property damage.

The best indicator of possible involvement appears to be

Conformity. It correlates significantly with violations, accidents, chargeable accidents, and suspensions. It appears further that Social Relationships would add to the refinement of accident involvement, because it correlates significantly with involvement (r=-0.09) -- at the .001 level -- and not with Conformity (r=0.03).

The two Drop-out Scales correlate significantly (r=0.09 to 0.11) with violations and suspensions, but not with accidents (r=0.06). These scales also correlate highly (r=0.68) to 0.72) with Conformity which produces highly significant correlation with all three involvement variables, as discussed earlier.

Masculine Egoism is significantly correlated with accicents and warning letters, but not with chargeable accidents. ME also is correlated with SR. Apparently it does not add much to the relationship with the involvement variables beyond that provided by Social Relationships and Conformity.

Tables 7 and 8 indicate the number of subjects as apportioned by driving experience and father's occupation. Table 7 was developed from the original nine categories of occupation, based on the DOT (47)(48) classifications, and the eight levels of driving experience derived from the drivers' license

Table 7. Number of subjects by driving experience and father's occupation: original data

Experience	Occupation									Total
	0	1	2	3	4	5	6	7	8	
None	7	2	2	4	5	1	0	2	1	24
Learner	0	1	2	3	3	0	0	0	1	10
Under 3 mos	4	5	2	13	21	3	4	7	4	63
3-6 mos	2	1	6	11	21	4	1	9	2	57
6-12 mos	4	7	12	20	41	10	10	26	4	134
1 year	10	21	31	65	146	24	24	66	21	408
2-5 years	20	25	56	101	457	36	71	183	34	983
6-10 years	0	0	0	0	1	0	1	2	0	4
Total	47	62	111	217	695	78	111	295	67	1683

0 = Unemployed
1 = Unskilled
2 = Semi-skilled
3 = Skilled
4 = Agriculture, etc.
5 = Service
6 = Clerical, sales
7 = Professional, managerial
8 = Deceased

Table 8. Number of subjects by driving experience and father's occupation: revised classifications

Experience	Occupation							Total
	0	1	2	3	4	5	6	
Under 6 mos	22	12	31	50	13	18	8	154
6-12 mos	11	12	20	41	20	26	4	134
1-2 years	31	31	65	146	48	66	21	408
Over 2 years	45	56	101	458	108	185	34	987
Total	109	111	217	695	189	295	67	1683

0 = Unemployed, unskilled
1 = Semi-skilled
2 = Skilled
3 = Agriculture, etc.
4 = Clerical, sales, service
5 = Professional, managerial
6 = Deceased

records. Since sample sizes were too small within some cells, Table 8 was prepared by partial regrouping. This is discussed on page 39.

The most populous cell in Table 8 is that which contains subjects with two or more years of driving experience and whose fathers were primarily engaged in agricultural pursuits. The next largest group is composed of those whose driving experience was within the same category but whose fathers were in the professional and managerial class. The smallest entry is that containing subjects whose fathers were deceased.

Five involvement variables correlated significantly with five MCI variables as discussed on page 57; of these, two involvement variables -- accidents and violations -- and one MCI variable -- Conformity -- produced the highest correlation coefficients. These are shown in Table 6 where all 1,683 subjects were involved in the gross analysis. Thus these three variables were selected for further analysis, moderated by occupation and experience variables.

In addition, tables of means were prepared for number of accidents, violations, injuries, chargeable accidents, and sum of property damages, by experience and occupation. It was felt that additional information would be obtained from tables

of means derived by summing through occupation and experience separately. While statistical significance for the injuries and property damage variables occurred less frequently than for other involvement variables, they are an inherent part of the accident and violation picture and figure prominently in public interest; thus summary tables are presented.

Table 9 presents the mean number of accidents, by driving experience and father's occupation. The group whose fathers were professional men or managers had the poorest record. This held true at the lower levels of experience as well as for those who had been driving for over two years. The group with the next highest mean number of accidents, at the one or more years of experience levels, was comprised of individuals from the lowest economic level -- those whose fathers were unemployed or unskilled. This group also was responsible for the highest number of accidents, for its size, with one year experience.

When Table 10 is considered, the professional and managerial group had the poorest mean accident record. One becomes aware of those young males whose fathers are deceased; while this group was very small, 67 in number, it ranked second in mean number of accidents when considered as a group

Table 9. Mean number of accidents, by driving experience and father's occupation

Experience	Occupation						
	0	1	2	3	4	5	6
Under 6 mos	.000	.000	.129	.000	.000	.167	.000
6-12 mos	.091	.000	.100	.220	.050	.231	.500
1-2 years	.226	.194	.185	.137	.208	.212	.381
Over 2 years	.356	.339	.307	.277	.324	.568	.353

0 = Unemployed, unskilled
1 = Semi-skilled
2 = Skilled
3 = Agriculture, etc.
4 = Sales, service, clerical
5 = Professional, managerial
6 = Deceased

Table 10. Number of accidents entered in each cell and means reported for the row and column marginals

Experience	Occupation							Sum	Number	Mean
	0	1	2	3	4	5	6			
Under 6 mos	0	0	4	0	0	3	0	7	154	.045
6-12 mos	1	0	2	9	1	6	2	21	134	.157
1-2 years	7	6	12	20	10	14	8	77	408	.189
Over 2 years	16	19	31	127	35	105	12	345	987	.350
Sum	24	25	49	156	46	128	22	450		
Number	109	111	217	695	189	295	67		1683	
Mean	.220	.225	.226	.224	.243	.434	.328			.267

without regard to experience level. The mean number of accidents for the entire sample of 1,683 subjects was .267 accidents.

The lowest economic level was responsible for the largest mean number of violations among the more experienced drivers in the study, as shown in Table 11. Farm boys (in the one to two year experience category) had a poor record.

The subjects at the highest experience level from an agricultural background had the best record with .480 violations. Several occupational groups maintained violation-free records in their first six months of driving, but no group had a record free of violations after six months.

Table 12 reports the mean number of violations for the entire study as .456 violations per subject. When occupations were considered without regard for amount of experience, the boys whose fathers had died had the largest mean number of violations, followed closely by the professional-managerial group. If the small group within "deceased" is disregarded, the professional-manager group had the poorest record supporting the results reported in Tables 9 and 10 for accidents. The lowest-level group, by occupation, had the poorest record in Table 9 (by experience) but ranked third in Table 10.

Table 11. Mean number of violations, by driving experience and father's occupation

Experience	Occupation						
	0	1	2	3	4	5	6
Under 6 mos	.000	.000	.129	.040	.000	.000	.125
6-12 mos	.091	.583	.100	.195	.200	.308	1.000
1-2 years	.387	.323	.246	.425	.292	.333	.381
Over 2 years	1.089	.500	.495	.480	.556	.800	.824

0 = Unemployed, unskilled
1 = Semi-skilled
2 = Skilled
3 = Agriculture, etc.
4 = Sales, service, clerical
5 = Professional, managerial
6 = Deceased

Table 12. Number of violations entered in each cell and means reported for the row and column marginals

Experience	Occupation							Sum	Number	Mean
	0	1	2	3	4	5	6			
Under 6 mos	0	0	4	2	0	0	1	7	154	.045
6-12 mos	1	7	2	8	4	8	4	34	134	.254
1-2 years	12	10	16	62	14	22	8	144	408	.353
Over 2 years	49	28	50	220	60	148	28	583	987	.591
Sum	62	45	72	292	78	178	41	768		
Number	109	111	217	695	189	295	67		1683	
Mean	.569	.405	.332	.420	.413	.603	.612			.456

Their earlier driving record tended to lower the mean when the violations were summed through experience levels. The sons of skilled workmen had the best violation record.

In Table 13 are reported the means for number injured, by driving experience and occupation. Table 14 provides the means for entire occupational groups when experience is combined within occupations. According to both tables, the agricultural group again had the best record for the most experienced drivers. Table 13 will not be discussed further because the number of injuries was small in any one cell.

The unemployed-unskilled class produced the highest mean number injured as shown in Table 14. The mean for the entire sample was .111 persons injured per driver in the study.

Tables 15 and 16 must be interpreted differently from all others except corresponding entries in Table 6 for each entry represents one unit per one hundred dollars of property damage.

The total property damage reported for the study was $172,500 resulting in a total mean of $102.50 per subject included in the analysis. It was shown in Table 1 that the study involved 450 accidents, caused by 345 subjects. This means that each accident cost on an average of $383.33 and

Table 13. Mean number injured, by driving experience and father's occupation

Experience	Occupation						
	0	1	2	3	4	5	6
Under 6 mos	.000	.000	.032	.000	.000	.056	.000
6-12 mos	.273	.000	.000	.000	.150	.038	.250
1-2 years	.065	.032	.046	.048	.104	.061	.333
Over 2 years	.267	.179	.208	.114	.139	.189	.059

0 = Unemployed, unskilled
1 = Semi-skilled
2 = Skilled
3 = Agriculture, etc.
4 = Sales, service, clerical
5 = Professional, managerial
6 = Deceased

Table 14. Number of injured entered in each cell and means reported for the row and column marginals

Experience	Occupation							Sum	Number	Mean
	0	1	2	3	4	5	6			
Under 6 mos	0	0	1	0	0	1	0	2	154	.013
6-12 mos	3	0	0	0	3	1	1	8	134	.060
1-2 years	2	1	3	7	5	4	7	29	408	.071
Over 2 years	12	10	21	52	15	35	2	147	987	.149
Sum	17	11	25	59	23	41	10	186		
Number	109	111	217	695	189	295	67		1683	
Mean	.156	.099	.115	.085	.122	.139	.149			.111

Table 15. Mean sum of property damages, by driving experience and father's occupation

Experience	Occupation						
	0	1	2	3	4	5	6
Under 6 mos	.000	.000	.387	.000	.000	.222	.000
6-12 mos	.182	.000	.150	.463	.150	.923	6.750
1-2 years	1.161	1.226	.923	1.151	.500	.742	1.619
Over 2 years	1.733	.839	.941	1.070	.685	2.259	.588

0 = Unemployed, unskilled
1 = Semi-skilled
2 = Skilled
3 = Agriculture, etc.
4 = Sales, Service, clerical
5 = Professional, managerial
6 = Deceased

Table 16. Amount of property damages entered in each cell and means reported for the row and column marginals

Experience	Occupation							Sum	Number	Mean
	0	1	2	3	4	5	6			
Under 6 mos	0	0	12	0	0	4	0	16	154	.104
6-12 mos	2	0	3	19	3	24	27	78	134	.582
1-2 years	36	38	60	168	24	49	34	409	408	1.002
Over 2 years	78	47	95	490	74	418	20	1222	987	1.238
Sum	116	85	170	677	101	495	81	1725		
Number	109	111	217	695	189	295	67		1683	
Mean	1.064	.766	.783	.974	.534	1.678	1.209			1.025

each of the involved drivers was responsible for an average of $500 for his share of the accident total.

Table 17 presents the number of accidents and the mean cost per accident within each occupational grouping, for comparison with Tables 15 and 16.

Table 17. Number of accidents, total cost, and mean cost per accident, by father's occupation

Occupation	Number of accidents	Total property damage	Mean loss per accident
Unemployed, unskilled	24	$11,600	$483.33
Semi-skilled	25	8,500	340.00
Skilled	49	17,000	346.94
Agriculture, etc.	156	67,700	433.97
Clerical, sales, service	46	10,100	219.57
Professional, managerial	128	49,500	386.72
Deceased	22	8,100	368.18

In all three tables it can be seen that the subjects whose fathers were in the clerical, sales, and service category had the best records for property loss. In Table 15, the "deceased" grouping had the lowest mean loss at the highest level of experience but this did not hold up in Table 16 when all experience was combined within occupation.

The worst records for financial loss per accident were

found in the unemployed-unskilled group and the agricultural group when the number of accidents within occupation was divided into the total property loss involved in those accidents, -- yielding the mean accident loss by occupation. In Table 15, the professional-managerial group showed an accident-loss mean of $225.90 for the highest within the most experienced drivers' classification. The greatest mean loss calculated for this same table was that of the fatherless males -- $675, with only four subjects in the cell, at the six to twelve months experience level. The lowest economic level and the farm group had poor showings at the highest level of experience. The highest mean in Table 16 is that of the professional-manager group, with a mean loss of $167.80 per subject.

The number of chargeable accidents was investigated and results are displayed in Tables 18 and 19. The males with fathers in the professional-managerial class were consistently high in the mean number of chargeable accidents, at all levels of experience. The fatherless boys in the six months to two years experience groupings had a high mean number of chargeable accidents.

Table 19 supports the finding of Table 18 that the group with the highest mean number of chargeable accidents was that

Table 18. Mean number of chargeable accidents, by driving experience and father's occupation

Experience	Occupation						
	0	1	2	3	4	5	6
Under 6 mos	.000	.000	.032	.000	.000	.111	.000
6-12 mos	.091	.000	.100	.146	.050	.231	.250
1-2 years	.161	.161	.169	.116	.167	.182	.333
Over 2 years	.289	.143	.208	.179	.204	.330	.265

0 = Unemployed, unskilled
1 = Semi-skilled
2 = Skilled
3 = Agriculture, etc.
4 = Sales, service, clerical
5 = Professional, managerial
6 = Deceased

Table 19. Number of chargeable accidents entered in each cell and means reported for the row and column marginals

Experience	Occupation							Sum	Number	Mean
	0	1	2	3	4	5	6			
Under 6 mos	0	0	1	0	0	2	0	3	154	.019
6-12 mos	1	0	2	6	1	6	1	17	134	.127
1-2 years	5	5	11	17	8	12	7	65	408	.159
Over 2 years	13	8	21	82	22	61	9	216	987	.219
Sum	19	13	35	105	31	81	17	301		
Number	109	111	217	695	189	295	67		1683	
Mean	.174	.117	.161	.151	.164	.275	.254			.179

of professional-managerial parentage. The fatherless fared poorly, as before, and the lowest economic level also had a poor record. The best record in both tables belonged to the sons of skilled workmen, with farmers' sons being second best. A mean of .179 chargeable accidents was found for the entire study.

Tables 20 and 21 were prepared to facilitate comparison of findings produced in sub-sample correlations, -- using "occupation" and "experience" as moderators. It has been shown that Conformity was the best indicator of possible accident and violation involvement. Table 20 shows the correlation coefficients between accident-involvement and Conformity, as well as the number of subjects in each cell. The level of significance is marked where warranted. Cells with no entries were those in which no variance in the involvement measure occurred. Table 21 was prepared in like manner, using violation-involvement and Conformity.

In Table 20, as would be expected, the significant correlations were associated with larger sample sizes. Only one correlation was significant in the direction opposite to what had been anticipated. Most correlations were in the direction of the overall correlation. The evidence suggests no reason

Table 20. Number of subjects (n) and correlation coefficients between accident-involvement and Conformity, by driving experience and father's occupation: $\frac{r}{n}$

Experience	Occupation						
	0	1	2	3	4	5	6
Under 6 mos			$\frac{-.15}{31}$			$\frac{.08}{18}$	
6-12 mos	$\frac{-.14}{11}$		$\frac{-.22}{20}$	$\frac{.01}{41}$	$\frac{-.22}{20}$	$\frac{-.21}{26}$	$\frac{-.96*}{4}$
1-2 years	$\frac{-.00}{31}$	$\frac{.25}{31}$	$\frac{.18}{65}$	$\frac{.08}{146}$	$\frac{.23}{48}$	$\frac{.13}{66}$	$\frac{-.22}{21}$
Over 2 years	$\frac{.27}{45}$	$\frac{.25}{56}$	$\frac{.22*}{101}$	$\frac{.14***}{458}$	$\frac{.19}{108}$	$\frac{.23***}{185}$	$\frac{-.14}{34}$

0 = Unemployed, unskilled
1 = Semi-skilled
2 = Skilled
3 = Agriculture, etc.
4 = Clerical, sales, service
5 = Professional, managerial
6 = Deceased

Table 21. Number of subjects (n) and correlation coefficients between violations and Conformity by driving experience and father's occupation: $\frac{r}{n}$

Experience	Occupation						
	0	1	2	3	4	5	6
Under 6 mos			$\frac{-.13}{31}$	$\frac{.46***}{50}$			$\frac{.12}{8}$
6-12 mos	$\frac{-.14}{11}$	$\frac{.31}{12}$	$\frac{.24}{20}$	$\frac{.13}{41}$	$\frac{-.14}{20}$	$\frac{.05}{26}$	$\frac{.19}{4}$
1-2 years	$\frac{.29}{31}$	$\frac{.50***}{31}$	$\frac{.30*}{65}$	$\frac{.14}{146}$	$\frac{.18}{48}$	$\frac{.24}{66}$	$\frac{-.18}{21}$
Over 2 years	$\frac{.38*}{45}$	$\frac{.19}{56}$	$\frac{.15}{101}$	$\frac{.13**}{458}$	$\frac{-.01}{108}$	$\frac{.21**}{185}$	$\frac{.04}{34}$

0 = Unemployed, unskilled
1 = Semi-skilled
2 = Skilled
3 = Agriculture, etc.
4 = Clerical, sales, service
5 = Professional, managerial
6 = Deceased

to suspect that the direction of relationship between the two variables is different for different experience or occupational levels.

Table 21 shows that all significant correlations are in the expected direction and again the size of the coefficient does not appear to be systematically related to experience or occupation.

It would appear that a stronger relationship between personality and involvement exists within the sub-groups than is found in the total sample, for the strength of the variables increases when moderator groups are used.

Longer experience leads to more accidents, injuries, violations, and property loss while shorter time periods do not yield much information. The latter is true because few subjects were included in the earlier experience stages. Of the 1,683 total subjects there were 1,395 who had driven for over a year; of these, 987 had more than two years of driving. By this criterion, the meaningful figures should be those recorded within the two higher levels of driving experience and more particularly in the group with more than two years experience.

Moderator Groups

The professional-managerial group had the poorest overall record. While ranking second in number of subjects and in number of accidents, their overall mean number of accidents at the two years or more level of experience was the highest of all recorded (.568). There were 295 subjects in this occupational grouping with an overall mean of .434 accidents. They ranked first in mean number of violations (.603) in the entire study, if the group whose fathers were deceased were disregarded. (There was very little difference in their means.) When two years and more of experience were considered, these upper-class youths were second in mean number of violations. They were first in mean property loss in both the two-year level and combined levels of experience, as well as in mean number of chargeable accidents at the same two experience levels. Their actual dollar loss and mean number of injuries were second high across time. The correlation between Conformity and number of violations at the highest driving experience level (0.21 for 185 subjects) was significant beyond the 1 percent level.

Young males from the lowest economic level, those whose fathers were unemployed or unskilled, had a poor record.

These 109 subjects had the highest mean number of violations of all groups studied (1.089) who had been driving two or more years. Their mean number of injuries was the highest while their mean property damage was second high, with an overall mean financial toll of $483.33 per accident. The mean number of chargeable accidents for this group was .174, which was second high if the deceased category is not considered. The correlation coefficient for this group (two years experience) was 0.38 for 45 subjects when calculated between Conformity and violations.

Boys from an agricultural background were highest in number of subjects in the study, number of accidents, total property damage, and second in mean property damage, as well as second high among accident means when experience levels were combined. They had the best record of all groups studied for mean number of accidents and violations after two years, mean number injured, and next to the fewest chargeable accidents. (They were much lower than the group with the fifth ranking number of chargeables.) The correlation of 0.14 for 458 subjects, between Conformity and accidents, for the more highly experienced of this group, was significant beyond the .001 level. The correlations between Conformity and viola-

tions at two experience levels -- beginners and two or more years -- were 0.46 for 50 subjects and 0.13 for 458 subjects, respectively. These reached the .001 and .01 levels of significance as given.

The boys in the clerical, sales, and service category produced the best record. They had no "highs" in any tabulations, with 189 total subjects, -- 108 of whom had been driving for more than two years. This group of young men was responsible for the lowest mean property loss. Their average loss was $219.57 per accident, as compared to $483.33 for the unemployed-unskilled group and $433.97 for the farm boys. No significant correlations between Conformity and accidents or violations were found.

As a matter of interest, the findings of the boys who had no living father are discussed here. This group has generally been disregarded because of its small size: 67, only 34 of whom had been driving for more than two years. In spite of its small size and low mean driving experience, these young males had the highest mean number of accidents and violations, and were second high in mean number of violations for the two-year group. They had the second largest mean number of chargeable accidents. The correlation of -0.96 (for four

subjects with six to twelve months of experience) between Conformity and accidents was significant at the .01 level. However, they did rank lowest in several areas of interest to the study. Their accident cost was low, with the lowest mean in both the two years and more and combined experience groupings, within occupation. At both experience levels while being involved in the smallest number of accidents, they had the lowest mean number of injured.

This study confirms the Shaw findings (38). She found a relationship between personality and conformity characteristics with South African truck drivers and the present study found the same relationship with Minnesota high school boys.

The Conformity scale used in this study yields scores which indicate a subject's type of adjustment in situations requiring responsible, conforming behavior. High scores generally are associated with individuals who are impulsive, irresponsible, and rebellious, -- who seem to learn little from experience. As found also by Shaw, such persons are self-centered and individualistic. Low scores are indicative of respect for authority and an understanding of the need for an orderly existence. Students who have an unfavorable family background coupled with high scores on the Conformity scale are

in need of counseling. Use of this information could be of value to a high school counselor or driver education instructor.

SUMMARY

This study was designed to provide information concerning human characteristics that may be responsible for the appalling loss of life, countless personal injuries, and costly property damage resulting from motor-vehicle accidents. It has been concerned with the human and environmental factors which might influence the liability of young drivers to accident and/or violation involvement.

Specifically, the objective of the investigation was as follows:

> To determine the relationship between personality and selected socio-economic variables and accident or violation involvement.

The subjects were 1,683 male high school students attending grades 11 and 12 in sixty-one Minnesota high schools in the years 1960-1964 who had been tested on the Minnesota Counseling Inventory through the statewide testing program. Used was a combination of questionnaires, MCI answer sheets, and driver record information. Correlation matrices and summary statistics were produced for the total sample and for sub-samples, using "occupation" and "experience" as moderators.

Fathers' occupations were divided into seven groups and

the subjects' driving experience into four levels for the sub-sample analyses.

The findings were as follows:

1. Children of extreme upper and lower economic levels tend to produce poor accident and violation records. The best records tend to come from children of white collar workers.

2. This study demonstrates a low but significant relationship between the personality variable, Conformity, and various indices of accident and violation involvement. When the moderator variables (father's occupation and subject's driving experience) were utilized, the relationship between the personality measure and the criterion variables was stronger.

3. The relationships of personality variables to the criteria are still so low that one cannot recommend the use of this instrument in its present form for diagnosing possible involvement. However, the size of the relationships obtained are such as to be of theoretical interest.

If persons could be identified who have different types of personalities related to accidents and violations, perhaps the occurrence of such involvement could be reduced by calling to the attention of the individual the fact that he has this pattern of characteristics. Item factor analysis would undoubtedly reveal which cluster of test items from the pool produced the significant correlations. These items could be combined into a new scale, such as "accident proneness", and

new correlation matrices produced for study. Needed is additional intensive study of personality correlates and their measurement within sub-groups formed by sub-categories of moderator variables.

LITERATURE CITED

1. Billion, C. E. Community study of the characteristics of drivers and driver behavior related to accident experience. Highway Research Board Bulletin 172: 36-94. 1958.

2. Bransford, T. Relation of performance on driver's tests to automobile accidents and violations of traffic regulations in the District of Columbia. Unpublished Ph.D. thesis. Library, The American University. Washington, D.C. 1939.

3. Brody, Leon. Personal characteristics of chronic violators and accident repeaters. Highway Research Board Bulletin 152: 1-2. 1957.

4. Brody, Leon. Personal factors in safe operation of motor vehicles. Center for Safety Education, New York University. New York, N.Y. 1941.

5. Brown, Paul L. and Berdie, Ralph F. Driver behavior and scores on the MMPI. Journal of Applied Psychology 44: 18-21. February, 1960.

6. Case, Harry W., Reiter, Ismar, Feblowicz, Ernst A., and Stewart, Roger G. The habitual traffic violator. Highway Research Board Bulletin 120: 31-36. 1956.

7. Case, Harry W. and Stewart, Roger G. Development of a driving attitude scale. Highway Research Board Bulletin 172: 30-36. 1958.

8. Clark, James A. Perceptual-motor speed discrepancy and deviant driving. Unpublished M.A. thesis. Library, Michigan State University. East Lansing, Michigan. 1959.

9. Cobb, P. W. Automobile driver tests administered to 3663 persons in Connecticut, 1936-37, and the relation of the test scores to the accidents sustained. Unpublished report. Highway Research Board. Washington, D.C. July, 1939.

10. Conger, John J., Gaskill, Herbert S., Glad, Donald D., Hassel, Linda, Rainey, Robert V., Sawrey, William L., and Turrell, Eugene S. Psychological and psychophysiological factors in motor vehicle accidents. American Medical Association Journal 169, No. 14: 1581-1587. April, 1959.

11. Danielson, Ralph W. Relationship of fields of vision to safety in driving. Traffic Safety Research Review 2, No. 3: 8-25. September, 1958.

12. De Silva, Harry R., Robinson, P., and Forbes, T. W. Some psychological factors in accident-repeater drivers. Journal of Abnormal and Social Psychology 34: 124-128. January, 1939.

13. Edwards, Dorothy S. and Hahn, Clifford P. The use of filmed driver behavior in the study of accidents. The American Institute of Research. Washington, D.C. 1965.

14. Gates, W. B. An investigation to determine the relationship between emotional immaturity and accident proneness. National Safety Congress Transactions 27: 52-54. 1958.

15. Ghiselli, Edwin E. and Brown, Clarence W. The prediction of accidents of taxicab drivers. Journal of Applied Psychology 33: 540-546. December, 1949.

16. Goldstein, Leon G. Human variables in traffic accidents: a digest of research. Traffic Safety 8, No. 1: 26-31. March, 1964.

17. Goldstein, Leonard G. and Mosel, James N. A factor study of drivers' attitudes, with further study on driver aggression. Highway Research Board Bulletin 172: 9-29. 1958.

18. Haner, Charles F. Use of psychometric instruments in the prediction of automobile accidents. National Safety Congress Transactions 23: 62-67. 1962.

19. Heath, Earl Davis. Relationships between driving records, selected personality characteristics, and biographical data of traffic offenders and non-offenders.

Highway Research Board Bulletin 212: 16-20. 1959.

20. Hurlock, Elizabeth B. Adolescent development. McGraw-Hill Book Company. New York, N.Y. 1955.

21. Hurlock, Elizabeth B. Child development. 4th ed. McGraw-Hill Book Company. New York, N.Y. 1964.

22. Johnson, Le Verne and Lauer, Alvhh R. The effect of induced manual handicaps on motor performance of a complex nature. Journal of Applied Psychology 21: 85-93. January, 1937.

23. Kainuma, Yoshiyuki. Studies on the personal characteristics of motor vehicle accident repeaters in Japan. Traffic Safety Reports [Tokyo, Japan.] 1: 35-43. March, 1965.

24. Lauer, Alvhh, R. Comparison of group paper-and-pencil tests with certain psychophysical tests for measuring driving aptitude of army personnel. Journal of Applied Psychology 39: 318-321. October, 1955.

25. Lefeve, B. A. Relation of accidents to speed habits and other driver characteristics. Highway Research Board Bulletin 120: 6-30. 1956.

26. Levonian, Edward, Centers, Richard, and Case, Harry W. Personality and biographical variables in relation to driving item response. Highway Research Record 79: 26-34. 1965.

27. McGuire, Frederick L. The safe driver inventory. U.S. Armed Forces Medical Journal 7, No. 9: 1249-1264. September, 1956.

28. Malfetti, James L. and Fine, Jerome L. Characteristics of safe drivers: a pilot study. Traffic Safety Research Review 6, No. 3: 3-9. September, 1962.

29. Marbe, Karl. The psychology of accidents. Human Factor 9: 100-104. January, 1935.

30. Moffie, D. J., Symmes, Andrew, and Milton, Charles R. Relation between psychological tests and driver performance. Highway Research Board Bulletin 60: 17-24. 1952.

31. National Safety Council. Accident Facts. 1965 edition. Author. Chicago, Illinois. 1965.

32. Rainey, Robert V., Conger, John J., Gaskill, Herbert S., Glad, Donald D., Sawrey, William L., Turrell, Eugene S., Walsmith, Charles R., and Keller, Leo. An investigation of the role of psychological factors in motor vehicle accidents. Highway Research Board Bulletin 212: 11-15. 1959.

33. Rommel, R. C. S. Personality characteristics and attitudes of youthful accident-repeating drivers. Traffic Safety Research Review 3, No. 1: 13-14. March, 1959.

34. Sappenfield, Bert R. Personality dynamics. Alfred A. Knopf, Publisher. New York, N.Y. 1954.

35. Schuster, D. H. The development of attitude scales to predict accident repeater and moving violator drivers. Unpublished Ph.D. thesis. Library, University of Southern California. Los Angeles, California. 1961.

36. Schuster, D. H. and Guilford, J. P. The psychometric prediction of problem drivers. Human Factors 6: 393-421. August, 1964.

37. Selling, L. S. Personality traits observed in automobile drivers. Journal of Criminal Psychopathology 1: 258-263. January, 1940.

38. Shaw, Lynnette. The practical use of projective personality tests as accident predictors. Traffic Safety Research Review 9, No. 2: 34-72. June, 1965.

39. Siebrecht, Elmer B. Driver attitudes--techniques of study and results obtained. Unpublished paper presented at Midwestern Psychological Association meeting, Columbus, Ohio, April, 1954. Driver Education Laboratory, Iowa State University. Ames, Iowa. 1954.

40. Siebrecht, Elmer B. Measuring driver attitudes. Center for Safety Education, New York University. New York, N.Y. 1941.

41. Slocombe, C. S. and Brakeman, E. E. Psychological tests and accident-proneness. British Journal of Psychology 21: 29-38. July, 1930.

42. Suhr, Virtus W. The Cattell 16 P. F. Test as a prognosticator of accident susceptibility. Iowa Academy of Science Proceedings 60: 558-561. 1953.

43. Suhr, Virtus W. Personality and driving efficiency. Perceptual and Motor Skills 12: 34. February, 1961.

44. Suhr, Virtus W. Relationship of personality traits and certain psycho-sociological factors to driving performance of commercial drivers. Unpublished M.S. thesis. Library, Iowa State University. Ames, Iowa. 1953.

45. Tarrants, William E. A study of the relationship between driving records, field driving performance and laboratory driving performance of professional automobile drivers. Traffic Safety Research Review 4, No. 1: 22-27. March, 1960.

46. Tillman, W. A. and Hobbs, G. E. The accident-prone automobile driver. American Journal of Psychiatry 106: 321-331. November, 1949.

47. U.S. Department of Labor. Employment Service. Dictionary of occupational titles. Part I. Definitions of titles. United States Government Printing Office. Washington, D.C. 1939.

48. U.S. Department of Labor. Employment Service. Dictionary of occupational titles. Part II. Titles and codes. United States Government Printing Office. Washington, D.C. 1939.

49. Venables, Peter. Car-driving consistency and measures of personality. Journal of Applied Psychology 40, No. 1: 21-24. January, 1956.

50. Viteles, Morris S. Research in selection of motormen. Journal of Personnel Research 4, No. 12: 173-199. April, 1926.

APPENDIX

IOWA STATE UNIVERSITY
of Science and Technology

AMES, IOWA 50010

Department of Psychology
Safety and Driver Education Laboratory

August 11, 1964

Office of the Superintendent
Laporte High School
Laporte, Minnesota

Dear Sir:

Enclosed is a list of former students of your school. The University of Minnesota has provided us with the MCI test results on 3,000 young Minnesota males. Among them were these names.

We are doing research on personality correlates of accident involvement and must have the full legal name and exact birth dates of each subject. State driver-license and accident files will be checked and to facilitate the search, the Minnesota Highway Commission must have this precise information.

All records will be coded, as will names, to preserve anonymity of the subjects. No information as to identity will be released, nor will test results be used for any but statistical purposes.

Would you please assist us by checking the names and birthdates? Spaces have been provided on the enclosed sheet for changes from and/or additions to our present, meager information.

Thank you for your kind consideration and assistance.

Sincerely,

Lillian C. Schwenk

(Mrs.) Lillian C. Schwenk
Head, Safety Education and
Research Program

LCS:lz

School_____ City & State_____

Date of Test_____ Grade or Class_____

#	Name as Given			Full Legal Name (corrections only)			Birthdate		
	Last	First	Middle	Last	First	Middle	Month	Day	Year

IOWA STATE UNIVERSITY
of Science and Technology

AMES, IOWA 50010

Department of Psychology
Safety and Driver Education Laboratory

November 4, 1964

Office of the Superintendent
Lancaster Public Schools
District No. 356
Lancaster, Minnesota 56735

Dear Sir:

Our research project on personality correlates of accident involvement among young males is progressing nicely. We have just returned from St. Paul where we analyzed the driving records of each of the subjects in the study. It was found that approximately ten per cent (10%) of the sample had never been licensed in Minnesota and we have adjusted our study accordingly.

Enclosed are sheets seeking additional information on the students who still remain in the study. We did not send these earlier because we were sure there would be some attrition and we could see no reason to request information on persons who would not be involved. This would have meant extra work for your staff and we realize that we are imposing on you as it is. Both Iowa and Minnesota officials are most grateful for your cooperation, as we are.

This will be the last request for assistance, unless in some extreme case we may need further clarification. However, we do not anticipate this as 19 schools have already returned the second phase and no questions arose.

We will provide information from our study when it is completed, if you desire it. Full copies will be deposited with the University of Minnesota and the Minnesota Highway Commission as well as the U. S. Bureau of Public Roads and the U. S. Public Health Service. No one is providing financial support for this project but we are hoping to be able to circulate the findings as requested.

Sincerely,

Lillian C. Schwenk

(Mrs.) Lillian C. Schwenk
Head, Safety Education and
Research Program

LCS:lz

INSTRUCTIONS FOR STUDENT-PERSONAL-DATA FORM

1. Check, at top of first sheet only, proper answer for questions relating to counselor, driver education, and use of the Minnesota Counseling Inventory.

2. For each student, place an X or a check ( ) in the column which best described him. The code used is as follows:

   Driver Ed. = Driver Education

   Yes = student completed a course in driver education

   No = student did not complete such a course

   Parents' Marital Status

   M = Married

   D = Divorced

   S = Separated

   W = Widowed

   U = Unknown

   G = Lived with a guardian

   Lived with Whom?

   M = Mother

   F = Father

   Both = Both

   Other = Guardian, other relative, friends, etc.

3. List father's occupation.

School_____ Do you have a counselor? Yes___; No___. How many?_____

Town_____ Do you offer Driver Education? Classroom only___; Complete course___; No___.

Date of Test_____ M.C.I. used by counselor___, Driver education instructor___, Administrator___?

Name	Driver Ed.		Parents' Marital Status						Lives with Parents				Father's Occupation
	Yes	No	M	D	S	W	U	G	M	F	Both	Other	

Accident Number	Names of Drivers Involved	Number Injured	Number Killed	Property Damage	Accident Type

35-1-0-03
Frislie, Galen E. 8/2/43

Date first licensed: 4 17 64

Violations		Accidents	
Speed	5-30-61	X-859103	12-8-58
Careless driv.	3-18-62		
W. letter	6-23-61		
Noisy muffler	5-3-62		
Speed	5-3-62		
Susp.	5-30-61/6-30-61		

Sample card

ACCIDENT AND VIOLATION CODES

Accident type

01 = MV:Pedestrian
02 = MV:MV
03 = MV:Street car
04 = MV:Animal drawn vehicle
05 = MV:Bicycle
06 = MV:Motorcycle, scooter, go-cart
07 = MV:Farm tractor
08 = MV:Animal
09 = MV:Fixed object
10 = MV:Other object
11 = MV:O'turned in roadway
12 = MV:Ran off roadway
13 = MV:Other non-collision
14 = MV:Train
15 = Miscellaneous

Violation type

01 = Speed too fast
02 = Failed to yield right of way
03 = Drove left of center
04 = Improper passing
05 = Disregarded stop sign
06 = Disregarded traffic signal
07 = Disregarded automatic R.R. signal
08 = Followed too closely
09 = Improper turn
10 = Vehicle not under control
11 = Careless driving
12 = Reckless driving
13 = Improper lane usage
14 = One-way street
15 = Failure to dim
16 = Had been drinking
17 = Open bottle
18 = Violation of restriction
19 = Violation of financial responsibility
20 = Violation of instruction permit
21 = Violation of suspension
22 = Violation of curfew
23 = No driver's license
24 = Fraudulent driver's license
25 = Permitting unlicensed person to drive
26 = Faulty equipment
27 = Illegal equipment
28 = Evading officer
29 = Leaving scene of accident
30 = Habitual violator
31 = No signal

KEY TO VARIABLES 1-29

Number	Name
1	Validity
2	Family Relationships
3	Social Relationships
4	Emotional Stability
5	Conformity
6	Adjustment to Reality
7	Mood
8	Leadership
9	Willingness to Admit Maladjustment
10	Social Introversion-Extraversion
11	Physical Health
12	Home and Family Adjustment
13	Self-sufficient Insensitivity
14	Masculine Egoism
15	Puritanical Over-control
16	Intropunitive Withdrawal; Adolescent Depression
17	Extrapunitive Withdrawal
18	Male Drop-out Scale
19	Combined Male-Female Drop-out Scale
20	Number of violations
21	Ever denied a license?
22	Number of warning letters
23	Number of suspensions
24	Number of revocations
25	Number of accidents
26	Sum of number injured
27	Sum of number killed
28	Sum of property damages
29	Number of chargeable accidents